



## Association between tobacco use and dental caries among Farmers residing in rural areas of Jaipur District of Rajasthan - A cross sectional Study

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### Abstract

**Background:** Tobacco use is a pernicious habit of world today. Being the world's biggest preventable killer, our universe is in a state of tobacco epidemic. Hence the present study is an attempt to evaluate the association between tobacco usage and Dental Caries among 18 years and above farmer population in rural areas of Jaipur, Rajasthan.

**Method:** The study was conducted among farmer population, data regarding the demographic and the personal information on tobacco use, and dental caries status was collected using pre designed and pre-tested Performa along with the basic health education pamphlets distribution which contained information about ill effects of tobacco use followed by verbal awareness on harmful effects of tobacco use.

**Results:** Among total 1225 study subjects, 1113 (90.9%) were males out of which 355 (29.0%) used smoke form of tobacco 182 (14.9%) consumed chewing form while 90 (7.3%) consumed both form and 486 (39.7%) were non users. Among rest of 112 (9.1%) females were non users. Dental caries distribution was found to have maximum Decayed and filled component 39.7%, 9.1% among non-users followed by only decayed component among smokers 29.0%, 14.9% in tobacco chewers and least in subjects 7.3% consuming both form of tobacco. Showing that there is highly significant association between dental caries and various form of tobacco (Chi Square = 129.4, P= 0.00).

**Conclusion:** The prevalence of tobacco use is very high specially among different socioeconomic strata. Therefore, tobacco awareness programs and tobacco cessation services tailor made for this group must be planned and implemented.

**Keywords:** Practice, dental caries, tobacco use, farmers,

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## Introduction

Tobacco use is a pernicious habit of world today. It is one of the greatest single health hazard and a self-imposed risk. Being the world's biggest preventable killer, Our universe is in a state of tobacco epidemic, with larger Population of tobacco users emerging day by day, it kills more people each year than AIDS, drug addiction, and car accidents combined. This number will climb to ten million by 2030, based on current trends.<sup>[1]</sup>

In India tobacco was introduced by Portuguese traders in the kingdom of Adil Shahi, the capital city of Bijapur, presently in Karnataka in South India. Asad Beg, ambassador of the Mughal Emperor Akbar, visited Bijapur during 1604-1605 and took back large quantities of tobacco from Bijapur to the Mughal Kingdom in the north and presented some to Akbar along with jewel-encrusted European-style pipes. Several nobles in Akbar's court were also given tobacco and pipes, and tobacco was appreciated by everyone, and thus the practice was introduced. After that the merchants began to sell it, so the custom of smoking spread rapidly.<sup>[2]</sup>

Tobacco use has a detrimental impact on both general and oral health. Major systemic adverse effects include various form of cancer (mainly lung cancer) and cardiovascular diseases. Likewise, there is strong evidence that tobacco use has numerous negative effects on oral health, ranging from staining of teeth and dental restorations to reduction in the ability to taste, development of oral diseases such as smokers' palate, oral cancer, potentially malignant disorders, oral candidiasis, and periodontal disease, significant structural remodeling of the oral and gingival mucosa as a result of atrophic alterations and significant difference in local humoral immunity (IgG) and cytokine.<sup>[3]</sup>

Dental caries (DC) is the most prevalent pandemic chronic non communicable disease affecting any age group and is dependent on a number of factors such as lifestyle, socioeconomic and socio demographic gradients, and the tobacco use. Although it is regarded currently as preventable disease with the regular oral hygiene habits, frequent fluoride usage, and less intake of sugars as major recommendations, it is still affecting the quality-of-life of many individuals of low- and high-income countries. Despite its multi factorial etiology, there exists an evocative relationship between tobacco

use and incidence of Dental Caries.<sup>[4]</sup> However, the veracious relation between these two is unclear till now since some studies suggest a positive association, whereas some negative.<sup>[5]</sup>

Jaipur the capital and the largest city of the Indian state of Rajasthan has a population of 3.1 million, making it the 10<sup>th</sup> most populous city in the country. Agriculture is the main occupation of Rajasthan people; other occupation includes livestock and mining, household industries trade and commerce. Rajasthan's food habit was influenced by both the war like lifestyles of its inhabitants and the availability of ingredients in this arid region. Bidi and gutka are the most commonly used tobacco products in the region.<sup>[6]</sup>

Thus, with this background, the current study was conducted to evaluate the association between tobacco usage and Dental Caries among 18years and above farmer population in rural areas of Jaipur, Rajasthan.

## Materials and methods

Jaipur, popularly known as the Pink City and a UNESCO World Heritage Site, is the capital and largest city of Rajasthan state. Founded in 1727 by Rajput monarch Jai Singh 2, it was one of the first planned towns in modern India, designed by Vidyadhar Bhattacharya and spanning an area of 11,136 sq km between 26°26' 08.11 and 27°51'2.11 north latitude and 52.59 to 76°17' 34.36 east longitude.<sup>[7]</sup>

Agriculture is one of major occupation of 66, 26,178 people according to the 2011 census outside city with bajra, wheat, mustard, barley, and gram are among the main crops farmed with men make up 39,633 and women make up 28,757 of the 68,390 people who work as agricultural labourers<sup>[6]</sup> are seen as areas where tobacco consumption is high, lack of awareness about the negative effects on one's health and number of people who have a false sense of well-being is increasing. Making such farmers of Jaipur as a main focus area of our study. The Cluster random sampling procedure was employed to collect the representative population. In which city was divided in four blocks Jaipur north (block 1), Jaipur south (block 2), Jaipur west (block 3) and Jaipur east (block 4). From each block one Village Panchayat was randomly chosen by lottery method. The list of individuals in each village panchayat aged 18 years and above was collected from voter list. The households were



sampled by systematic random sampling. The sampling interval was calculated by

**Sampling interval** = Total no of households (HH) in that village /No. of HH to be surveyed in each village

The first sample household in each block village panchayat was selected randomly (lottery method) choosing a number within the sample interval ignoring the decimal. The next household was identified by adding the sampling interval with the first randomly chosen number. All the villagers were informed about the study well in advance so as to attain maximum attendance. The study group was selected from farmers who met the inclusion and exclusion criteria.

#### **Inclusion criterion**

1. Individuals present on the day of examination and had completed 18 years of age.
2. Individuals who consumed tobacco in any form.

#### **Exclusion criteria**

1. Individuals suffering from any systemic diseases and drug usage that could influence dental caries experience and
2. Individuals who are not willing to participate in the study.

Ethical clearance was obtained from the ethical committee of the institute, and the permission to conduct study was obtained from village panchayat.

#### **Calibration**

Oral examination of the entire study participant was carried out by single investigator. Examiner who was trained and calibrated in the Department of Public Health Dentistry, by a senior faculty member. Training took 2 days, and further 2-3 days for calibration. First, the examination was conducted on the group of 10 participants with a wide range of disease conditions and than twenty preselected individuals were examined twice consistently, with a time interval of at least 30 minutes and the result of both the examination were compared to estimate the extent and nature of diagnostic variability.

#### **Examination and data collection**

Pre- designed and Pre-tested performa was created using WHO oral health assessment form (1997),<sup>[8]</sup> Global Tobacco Surveillance system developed by the

World Health Organization (WHO), and Centers for Disease Control (CDC).<sup>[9]</sup>

Data regarding the demographic and the personal information on tobacco use was collected along with the basic health education pamphlets distribution was done which contained information about ill effects of tobacco use. Verbal information was also provided to all the study subjects. There was discussion with study subjects about oral hygiene maintenance, dietary habits and tobacco quitting methods, which provided encouragement, support and training on educational and coping skills.

The questionnaire consisted of 5 sub-sections developed to assess: a) Farmers socio demographic characteristics (age, gender, occupation, education level, income and oral hygiene aids ); b) information regarding (tobacco use and form); c) Dental caries status of subjects using (DMFT Index) was assessed; d) Oral hygiene status was assessed using (OHI-S index); e) and last part comprised of diet history of last 24 hrs which also included the sugar score of the subjects.

#### **Study setting**

A clean well illuminated and ventilated room with two gates one for entry and one for exit was selected for examination to avoid crowding and noise. The farmers were made to sit on a chair at a place with sufficient natural daylight. A table, on which instruments and other armamentaria were arranged, was placed within easy reach of the examiner. Clinical oral examinations were carried out by a single examiner, who was assisted by the recorder while examining the participant and called out the scores for each item of examination clearly, and the recorder then entered it in the pro forma for each participant examined. The recording assistant was allowed to sit close enough to the examiner could see that the findings were being recorded correctly.

#### **Statistical analysis**

The data so collected was entered in the Microsoft Excel 2007 and analyzed using the SPSS statistical software 20.0 Version. Means and standard deviations were calculated for continuous variables while percentages and frequencies were generated for categorical variables.



Independent t- test and analysis of variance were used to compare the quantitative variables between various groups. Chi- square test was used to test the association between tobacco usage and caries experience.  $P \leq 0.05$  was considered statistically significant.

## Results

Among total 1225 study subjects, 1113 (90.9%) were males out of which 355 (29.0%) used smoke form of tobacco 182 (14.9%) consumed chewing form while 90 (7.3%) consumed both form and 486 (39.7%) were non users. Among rest of 112 (9.1%) females were non users. The study subject's aged ranged from 18 to 58 years and above in which 151 (12.3%) were smokers 18-27 years. In the age group of 28- 37 years 413 (33.7%) were non users. Among 38-47 years 105 (8.6%) were non users. Most of the total subjects in age group of 48-57 years 45 (3.6%) consumed both form of tobacco. In the higher age group of 58 years and above 64 (5.2%) used smoke form of tobacco mostly. Majority of the tobacco users in upper class used smoke form of tobacco 151 (12.3%). In upper middle and upper lower class 413 (33.7%) and 105 (8.6%) were non users. Most of the subjects in lower middle 24 (2.0%) and lower 64 (5.2%) class were smokers (Table-1).

Among smokers, 151 (12.3%) used finger and tooth powder. In tobacco chewers 101 (6.9%) used tooth brush and paste. Subjects consuming both form of tobacco 90 (7.3%) and non-users 598 (48.8%) used tooth brush and paste as an oral hygiene cleaning aid respectively (Table-1).

Table 2 Illustrates Dental caries distribution according to tobacco consumption habit in study subjects it was found that maximum Decayed and filled component 486 (39.7%), 112 (9.1%) was present among non-users followed by only decayed component among smokers 355 (29.0%), 182 (14.9%) in tobacco chewers and least in subjects 90 (7.3%) consuming both form of tobacco. Showing that there is highly significant association between dental caries and various form of tobacco and non-users (Chi Square = 129.4,  $P = 0.00$ ).

Table 3 Shows Comparison of mean DFT among tobacco users according to the form of tobacco. It was found that mean DFT was higher among individuals using both form of tobacco ( $1.00 \pm 0.18$ ) followed by individuals using smokeless form ( $0.77 \pm 0.32$ ), smoke form

( $0.55 \pm 0.25$ ) and least in non- users ( $0.18 \pm 0.03$ ), and the difference was not statistically significant ( $p = 1.00$ ).

Table 4 shows comparison of mean OHI-S among tobacco users according to the form of tobacco. The mean OHI-S was higher among individuals using both Form of tobacco ( $0.37 \pm 0.46$ ) followed by individuals using smokeless form ( $0.18 \pm 0.34$ ), smoke form ( $0.16 \pm 0.42$ ) and least in non-users ( $0.17 \pm 0.03$ ), and the difference was statistically significant ( $p = 0.00$ ).

Table 5 compares of mean sugar score among tobacco users according to the form of tobacco, mean sugar score was higher among non-users ( $0.18 \pm 0.46$ ) followed by subject using both form ( $0.17 \pm 0.25$ ), smokeless form ( $0.10 \pm 0.20$ ) and least in smokers ( $0.07 \pm 0.035$ ), and the difference was statistically significant ( $p = 0.00$ ).

Table 6 compares of the mean decayed filled teeth between low- and high- sugar consumption groups according to tobacco usage, mean DFT was lower among tobacco users with low ( $0.62 \pm 0.32$ ) and high- sugar consumption ( $0.63 \pm 0.21$ ) compared to their counterparts, and the difference was statistically significant ( $p = 0.001$ ,  $p = 0.004$ )

Table-7 Compares of the mean decayed filled teeth between good, fair and poor simplified oral hygiene index groups according to tobacco usage, mean DFT of tobacco users with poor ( $0.37 \pm 0.77$ ), fair ( $0.56 \pm 0.24$ ) and good ( $0.40 \pm 0.23$ ) OHI-S scores was lower when compared to that of tobacco nonusers, and the difference was statistically significant ( $p = 0.60$ ,  $p = 0.005$ ,  $p = 0.00$ ).

## Discussion

Since the Portuguese introduced tobacco to India in 600 AD, there has been a steady increase in the use of tobacco in various forms by the Indian population, which now numbers 267 million adult users of tobacco. [10] Tobacco users become hooked as a result of the chemicals in tobacco products, which are true a stimulant having characteristics similar to cocaine and amphetamines but has 1000 times the potency of amphetamines and is 1000 times more potent than alcohol.

The multiple negative consequences of tobacco on dental health have been documented in the literature for decades. [11-15] Tobacco use and its consequences on DC, on the other hand, are a contentious topic. Early



research suggests that smokers have a low DC. Schmidt reinforced this theory in 1951 when he observed that an increase in tobacco smoking was accompanied with a decrease in the rate of caries. Smoking raises the level of thiocyanate in the saliva. <sup>[16]</sup> Thiocyanate, a naturally occurring component of saliva has been discovered to have a caries-inhibiting action.

To date, a number of researchers have identified a link between increased smoking levels and DC. The increased amount of lactobacilli and Streptococcus mutans in the smoker's saliva, as well as the diminished buffering function, may indicate an increased vulnerability to caries. Smoking has also been linked to reduced salivary cystatin activity and cystatin C output during gingival inflammation, according to studies. These cystatins are considered to help keep teeth healthy by inhibiting specific proteolytic enzymes and therefore enhancing DC.

The present study studied the influence of tobacco use among farmers in developing dental caries. Among the total of 1225 study subjects, 1113 (90.9%) were males out of which 355 (29.0%) used smoke form of tobacco 182 (14.9%) consumed chewing form while 90 (7.3%) consumed both form and 486 (39.7%) were non users. Among rest of 112 (9.1%) females were non users respectively. Tobacco consumption was seen as a deep rooted habit in which 151 (12.3%) were smokers and 45 (3.7%) were non users in 18-27 years. In the age group of 28- 37 years 85 (6.9%) were smokers 101 (8.2%) consumed chewing tobacco, 45(3.6%) consumed both form while 413 (33.7%) were non users. Among 38-47 Years 31 (2.57%) subjects were smokers, 77(6.3%) were tobacco chewers and rest 105 (8.6%) were non users. Most of the total subjects in age group of 48-57 years 45 (3.6%) consumed both form of tobacco followed by non-users 35 (2.0%), while 24 (2.0%) were smokers and 4 (0.3%) used chewing form. In the higher age group of 58 years and above 64 (5.2%) used smoke form of tobacco respectively.

Individuals who are not consuming tobacco were found to have more dental caries, as compare to tobacco users and it was statistically significant (P = 0.01). Similar results were found in Ainamo in 1971,<sup>[17]</sup>Williams et al. in 2000<sup>[18]</sup>Sgan-Cohen et al. in 2000, <sup>[19]</sup> Aguilar-Zinser et al. in 2008, <sup>[20]</sup> and GolpasandHagh et al.

In 2013.<sup>[21]</sup> The reason for this might be that due to continuous chewing of tobacco; there was wear of occlusal surface which accounts for less dental caries.

The mean DFT was higher among individuals Using both forms of tobacco ( $1.00 \pm 0.18$ ) followed by Individuals using smokeless form ( $0.77 \pm 0.32$ ) and smoke forms ( $0.55 \pm 0.25$ ), and the difference was not statistically significant. These results were in accordance with studies done by Schmidt <sup>[22]</sup>and Hugoson et al. <sup>[23]</sup>However, contradicting findings were observed in the studies done by Aguilar-Zinser et al [20]. And Tada and Hanada. <sup>[24]</sup>

Since diet, especially sugar consumption, and oral hygiene could act as effect modifiers in the association between tobacco use and DC experience, OHI-S Scores and sugar scores were recorded. The mean OHI-S was higher among individuals using both form of tobacco ( $0.37 \pm 0.46$ ) followed by individuals using smokeless form ( $0.18 \pm 0.34$ ), smoke form ( $0.16 \pm 0.42$ ) and least in non-users ( $0.17 \pm 0.03$ ), and the difference was statistically significant ( $p = 0.00$ ). Among the individuals with poor, fair, and good OHI-S, tobacco users were having low mean DFT compared to nonusers.

Furthermore, Diet, especially with high -sugar content, can cause an increase in DC. <sup>[25]</sup> The mean sugar score was higher among non-users ( $0.18 \pm 0.46$ ) followed by subjects using both form ( $0.17 \pm 0.25$ ), smokeless form ( $0.10 \pm 0.20$ ) and least in smokers ( $0.07 \pm 0.035$ ), and the difference was statistically significant ( $p = 0.00$ ). The findings of the current study also showed a low mean DFT among individuals consuming low-sugar diet compared to individuals consuming high-sugar diet, there was statistically significant difference between tobacco users and nonusers with respect to the mean sweet score. These two findings confirm the fact of less caries experience among tobacco users in spite of similar sweet scores and oral hygiene status. These verdicts of the current study confirm the role of tobacco solely in less caries experience. Similar finding was found in the study conducted by AshaLodagala et al. <sup>[26]</sup>



**Conclusions:**

This original article describes different forms of tobacco usage and its direct relationship with the prevalence of dental caries. Tobacco use along with co-existing factors like age, bad oral hygiene habits, food Habits and overall health standards can be associated with high caries incidence. However, a direct etiological relationship is lacking. Existing findings are not sufficient and conclusive enough to confirm that tobacco use solely causes dental caries. Oral use of smokeless tobacco (ST), predominantly tobacco chewing, is presumably a positive contributing factor to higher incidence of dental caries. Unfortunately, published studies are not converging towards one single factor through which tobacco usage can have direct relationship to dental caries.

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**Table1- Demographic variables of the study population**

Demographic variables	Tobacco Consumption			
	Smoke form	Chewing form	Both	Non users
<b>Gender</b>				
Male	355(29.0%)	182(14.9%)	90(7.3%)	486(39.7%)
Female	0(0.0%)	0(0.0%)	0(0.0%)	112(9.1%)
<b>Total</b>	<b>355(29.0%)</b>	<b>182(14.9%)</b>	<b>90(7.3%)</b>	<b>598(48.8%)</b>
<b>Age (years)</b>				
18-27 years	151(12.3%)	0(0.0%)	0(0.0%)	45(3.7%)
28- 37 years	85(6.9%)	101(8.2%)	45(3.6%)	413(33.7%)
38-47 years	31(2.5%)	77(6.3%)	0(0.0%)	105(8.6%)
48-57 years	24(2.0%)	4(0.3%)	45(3.6%)	35(2.0%)
58 years and above	64(5.2%)	0(0.0%)	0(0.0%)	0(0.0%)
<b>Total</b>	<b>355(29.0%)</b>	<b>182(14.9%)</b>	<b>90(7.3%)</b>	<b>598(48.8%)</b>
<b>Socio economic status</b>				
Upper class	151(12.3%)	0(0.0%)	0(0.0%)	45(3.7%)
Upper middle class	85(6.9%)	50(4.0%)	0(0.0%)	413(33.7%)



Upper lower class	31(2.5%)	77(6.3%)	0(0.0%)	105(8.6%)
Lower middle class	24(2.0%)	4(0.3%)	90(7.3%)	17(1.4%)
Lower class	64(5.2%)	50(4.2%)	0(0.0%)	17(1.4%)
<b>Total</b>	<b>355(29.0%)</b>	<b>182(14.9%)</b>	<b>90(7.3%)</b>	<b>598(48.8%)</b>
<b>Oral hygiene practice</b>				
Finger and tooth powder	151(12.3%)	4(0.3%)	0(0.0%)	0.0(0.0%)
Tooth brush & tooth paste	109(8.9%)	101(8.2%)	90(7.3%)	598(48.8%)
Neem stick	31(2.5%)	77(6.3%)	0.0(0.0%)	0.0(0.0%)
Charcoal	64(5.2%)	0(0.0%)	0.0(0.0%)	0(0.0%)
<b>Total</b>	<b>355 (29.0%)</b>	<b>182 (14.9%)</b>	<b>90 (7.3%)</b>	<b>598 (48.8%)</b>

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**Table-2 Dental caries distribution according to tobacco consumption habit in study subjects.**

DFT	Tobacco consumption				Chi square	P value
	Smoke form	Chewing form	Both	Non users		
Decay	355(29.0%)	182(14.9%)	90(7.3%)	486(39.7%)	129.4	0.00
Filled	0(0.0%)	0(0.0%)	0(0.0%)	112(9.1%)		
<b>Total</b>	<b>355(29.0%)</b>	<b>182(14.9%)</b>	<b>90(7.3%)</b>	<b>598(48.8%)</b>		

**Table-3 Comparison of mean DFT among tobacco users according to the form of tobacco.**

Tobacco consumption	N	MEAN DFT	P VALUE
Smoking form	355	0.55±0.25	1.00
Chewing form	182	0.77±0.32	
Both	90	1.00±0.18	
Non users	598	0.18±0.03	





**Table-4 Comparison of mean OHI-S among tobacco users according to the form of tobacco.**

Tobacco consumption	N	MEAN OHI-S		P VALUE
Smoke form	355	0.16±0.42	0.00	
Chewing form	182	0.18±0.34		
Both	90	0.37±0.46		
Non-users	598	0.17±0.05		

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**Table-5 Shows comparison of mean sugar score among tobacco users according to the form of tobacco.**

Tobacco consumption	N	MEAN SUGAR SCORE		P VALUE
Smoke form	355	0.07±0.35	0.00	
Chewing form	182	0.10±0.20		
Both	90	0.17±0.25		
Non- users	598	0.18±0.34		

**Table-6 Comparison of the mean Decayed Filled teeth between low- and high- sugar consumption groups according to tobacco usage**

DFT	Tobacco habit	N	DFT (mean ±SD)	P VALUE
Low sugar score	Present	15	0.62±0.32	0.001
	Absent	10	1.39±0.80	
High sugar score	Present	602	0.63±0.21	0.004
	Absent	496	1.63±0.56	

**Table-7 Comparison of the mean Decayed Filled teeth between good, fair and poor simplified oral hygiene index groups according to tobacco usage**

OHI-S	TOBACCO HABIT	N	DFT (mean ±SD)	P VALUE
Poor	Present	561	0.37±0.77	0.60
	Absent	486	0.19±0.39	
Fair	Present	30	0.56±0.24	0.005
	Absent	36	1.80±0.62	
Good	Present	74	0.40±0.23	0.00
	Absent	37	1.43±0.42	

